

## CHAPTER

# 2 Type Selection

All structure foundations have in common one fundamental characteristic; that is, they provide a means whereby service loads are transmitted into the supporting medium.

For new construction, the types of structure foundations that can be used are generally limited by geologic conditions. For bridge widenings, bridge rehabilitation, and seismic retrofits, the types of structure foundations that can be used may also be limited by site accessibility, overhead clearance, superstructure requirements, existing utilities, and noise restrictions.

Structure foundations can generally be classified in the following categories:

(1) footing foundations (frequently referred to as spread footings), (2) pile-supported foundations (driven and non-driven piles), and (3) special case foundation types that would include pier columns, tiebacks, soil nails, and tiedowns.

The primary source of information for structure foundation decisions is the Foundation Report prepared by the Office of Structural Foundations of the Engineering Service Center. The Project Designer selects the appropriate foundation type based upon data and recommendations contained in the Foundation Report.

For pile-supported foundations, it is the Project Designer's responsibility to select the type of pile consistent with the Foundation Report's recommendations. Additionally, the selected pile type should fulfill the requirements for economy, competitive bidding, and availability for the particular conditions prevailing at the site.

Instead of a specific recommendation as to foundation type, the Engineering Geologist may provide the Project Designer with engineering data for both footing and pile foundations. In this case, existing field conditions and/or economics will generally determine the foundation type.

While it is true that the foundation type is determined primarily by the geological nature of the foundation material itself, non-geological features are considered in the selection and design of structure foundations.

All available site data is reviewed by the Engineering Geologist and the Project Designer to determine if there are existing conditions or proposed changes that would restrict or exclude certain foundation types.

Seal courses are frequently specified as a foundation aid when water problems are anticipated. Seal course concrete is placed under water, the general purpose being to seal the bottom of a tight cofferdam against hydrostatic pressure. This enables dewatering of the cofferdam and construction of the footing “in the dry.”

Various geologic and non-geologic features affecting type selection are discussed in the following table. Most of these items will be discussed in more detail elsewhere in this manual.

TYPE SELECTION	USE
Footings Foundations	...are virtually unlimited in use. Geologic considerations include the soil profile, the location of the water table and any potential fluctuation, and the potential for scour or undermining. Non-geologic considerations include the size and shape of the footing, adjacent structures, and existing utilities.
Driven Piles	...are used where foundation material will not support a footing foundation or discourages the use of a Cast-In-Drilled Hole (CIDH) concrete pile. Pile types are precast concrete, steel structural sections, steel pipe, and timber. Geologic considerations include the soil profile, driving difficulties, and corrosive soil problems. Non-geologic considerations include adjacent structures, existing utilities, required pile length, restricted overhead clearances, accessibility, and noise restrictions.
Non-Driven Piles	...consist of CIDH concrete piles and alternative footing design piles. CIDH piles are used extensively where piles are required and foundation conditions permit their use. The slurry displacement method of construction of CIDH piles is used where driven piles are impractical and ground conditions necessitate its use. Alternative footing design piles are used on an experimental basis when conditions warrant their use. Geologic considerations include the location of the water table and potential fluctuation, and the soil profile. Non-geologic considerations include adjacent structures, existing utilities, restricted overhead clearances, and accessibility.
Special Case Foundations <i>Pier Columns</i>  <i>Tiebacks and Soil Piles</i>  <i>Tiedowns or Tension Piles</i>	<p>...represent special applications and, therefore, have limited use.</p> <p>...are generally used for hillside structures, thus eliminating the extensive excavation that would be required for large spread footings. The location and type of existing structures may restrict excavation limits.</p> <p>...are used for earth retaining structures where it is not feasible to excavate and construct a footing foundation or pile cap for a conventional retaining wall. Geologic considerations include the soil profile and corrosive soil problems. Non-geologic considerations include adjacent structures, accessibility, and existing utilities.</p> <p>...are used, in general, for seismic retrofitting of existing footings where overturning must be prevented.</p>

Generally, footing foundations are more economical than pile supported foundations.

CIDH concrete piles are the most economical pile-supported foundation with steel piles generally being the most expensive.